

Attorney Docket No.: T3110(C)  
Serial No.: 10/587,722  
Filed: July 27, 2006  
Confirmation No.: 2308

## **REMARKS**

### ***Amendments to the Claims***

In an earnest effort to advance prosecution of the application claim 1 has been amended without prejudice to recite a preferred embodiment of applicants' invention which further differentiates its subject matter from the prior art.

Amended claim 1 now specifies that porous bodies dissolves or disperses in the non-aqueous media in less than 3 minutes as disclosed on page 1, line 30 of the specification.

Claims 21 and 22 are new and recite additional preferred embodiments of applicants' invention

Claim 21 specifies that the porous bodies recited in claim 1 dissolve or disperse in the non-aqueous media in less than 30 seconds as disclosed on page 1, lines 31 of the specification.

Claim 22 specifies that porous bodies recited in claim 1 are made by a process that includes the steps disclosed on page 5 line 33 and continuing to page 6, line 7, namely:

- a) providing an intimate mixture of the polymeric material and the surfactant in a liquid medium
- b) providing a fluid freezing medium at a temperature effective for rapidly freezing the liquid medium;
- c) cooling the liquid medium with the fluid freezing medium at a temperature below the freezing point of the liquid medium for a period effective to rapidly freeze the liquid medium; and

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d) freeze drying the frozen liquid medium to form the porous bodies by removal of the liquid medium by sublimation.

Claims 8-20 are hereby withdrawn in response to a restriction requirement made on April 12, 2009.

***Election/Claim Rejections – 35 USC § 101***

Claims 8-20 have been withdrawn in compliance with a restriction requirement made April 12, 2009.

***Priority***

According to the Office Action mailed April 15, 2009, Applicants claim for foreign priority under 35 USC 119 was not considered for Application number UK 0401947.7 filed January 24, 2004 because Applicant needs to submit a certified copy .

In applicants' transmittal letter entered by the USPTO July 27 2006, a copy of which is attached, applicants indicated under Item 5 that a copy of the International Application has been communicated by the International Bureau under USC §371 C(2). Applicants' agent is under the impression that the International Application was indeed transmitted by the International Bureau. If this is not the case, would the Examiner please notify Applicants' agent, if possible at the telephone number below, as to how the situation should be remedied so that the foreign priority date can be secured.

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### ***Double Patenting***

**Claim 1-2 and 5-7 were provisionally rejected on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claim 1-2 and 8-10 of copending Application No. 10/587,732.**

Applicants have submitted a separate terminal disclaimer and appropriate fee in compliance with 37 CFR 1.321 (c) which applicants assume overcomes the double patenting rejection.

### ***Claim Rejections – 35 USC § 102***

**Claims 1-7 were rejected under 35U.S.C. 102(b) as being anticipated by Barby et al (U.S. 4,522,953).** Applicants respectfully request the Examiner's reconsideration in view of above amendments and following remarks.

#### **Statement of Facts**

Barby discloses that "Cross-linked homogenous porous polymeric materials are prepared by polymerization of monomers as the continuous phase in a high internal phase emulsion having above a critical limit of surfactant to ensure adequate absorbtivity. The porous materials may be dried and refilled with selected liquids and act as a high capacity reservoir." Abstract – Emphasis added

Barby discloses the "a homogeneous porous cross-linked polymeric block material in which the monomers are polymerised in the form of a high internal phase emulsion comprising, as the internal phase, at least 90% by weight of the emulsion of water; the remainder of polymerisable monomers, and from 5 to 30% by weight of the

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monomers of surfactant and from 0.005 to 10% by weight of the monomers of a polymerisation catalyst". (Column 6, lines 23-30 - Emphasis added)

Barby further teaches that the polymers of the invention "have a high capacity of absorbing and retaining liquids and, due to their cross-linked polymeric nature, an ability to carry liquids significantly better than that of hitherto known porous thermoplastic compositions." (Column 2, lines 33-37 – Emphasis added)

Barby teaches that "the polymeric block material has an absorbency for hydrophobic liquids defined in terms of oleic acid of at least 7 cc/g. The porous material provided by this invention comprises a series of pores interlinked with pinhole apertures, hence giving a material of exceptional absorbency". (Column 2, lines 45-47 – emphasis added).

In contrast applicants' invention is directed to the problem of increasing the rate of solution and/or dispersion of polymers in water-immiscible non-aqueous media. Applicants' porous bodies are soluble or dispersible in non-aqueous media comprising a three dimensional open cell lattice containing 10 to 95% by weight of a polymeric material which is soluble in water immiscible non-aqueous media and 5 to 90% by weight of a surfactant. The porous bodies having an intrusion volume as measured by mercury porosimetry of at least about 3 ml/g; and dissolves or disperses in the non-aqueous media in less than 3 minutes.

Applicants teach that the rapidly dissolving or dispersing porous bodies are a consequence of the method used to prepare the porous bodies. In contrast to Barby, applicants form an emulsion of water in a water immiscible liquid which contains a preformed polymer which is soluble in the water immiscible liquid. This emulsion is then rapidly frozen using a fluid freezing medium which cools both phases of the emulsion to

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below the freezing point of the liquids in the emulsion. Finally, the frozen emulsion is freeze dried to remove the frozen water and a water immiscible liquid by sublimation. (page 6, line 8 – 28).

Thus, in applicants method the oil-soluble polymer is already formed before the preparation of the porous bodies and no polymerization takes place during the preparation of the porous body.

#### Applicants Argument

It is a well established fact in polymer science that cross-linked polymers have at most very low solubility. For example Billmeyer, in his classic Textbook of Polymer Science states on page 23-24 (Exhibit 1) in a discussion of “*Polymer Texture and Solubility*” (Chapter 2 Polymer Solutions) that

*From what has already been said, it is clear that the topology of the polymer is highly important in determining solubility. Crosslinked polymers do not dissolve but only swell if indeed they interact with a solvent at all. In part, at least, the degree of this interaction is determined by the extent of cross-linking: lightly cross-linked rubbers swell extensively in solvents in which the unvulconized [un-crosslinked] material would dissolve, but hard rubbers, like many thermosetting resins may not swell appreciably in contact with any solvent (Emphasis added)*

The porous materials disclosed by Barby are composed of a continuous network of a cross-lined polymer, i.e., they are in essence a thermostat. As such these materials are incapable of dissolving or dispersing when contacted by a hydrophobic liquid (i.e., a water-immiscible liquid). Indeed, the whole objective of Barby, which is the creation of a crosslinked polymeric material that has a high capacity to absorb hydrophobic liquids,

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would have been defeated by constructing a porous polymeric material comprised of a water-immiscible-soluble-polymer that rapidly dissolves or disperses in the hydrophobic liquid.

Thus, the polymeric materials disclosed by Barby are incapable of being soluble or dispersible in non-aqueous media, let alone dissolving or dispersing in the non-aqueous media in less than 3 minutes and are not a comprised of a three dimensional open cell lattice comprised of a polymeric material which is soluble in water immiscible non-aqueous media.

MPEP 706.02 states that

“...for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present.”

Absent the teaching of a porous body which is soluble or dispersible in non-aqueous media, which can dissolve or disperse in the non-aqueous media in less than 3 minutes and which comprises a three dimensional open cell lattice comprised of a polymeric material which is soluble in water immiscible non-aqueous media, Barby can not anticipate applicants claims.

Neither is applicants' invention obvious from the teachings of Barby. Barby is directed to an entirely different objective technical problem from applicants': Increasing retention and absorbency of hydrophobic liquids by polymeric bodies Vs increasing the rate solution or dispersion of polymers in water immiscible liquids. By teaching materials which are formed by in-situ polymerization of monomers and are crosslinked, Barby in point of fact teaches away from applicants' porous bodies and method of preparation.

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**Claims 1-7 were rejected under 35U.S.C. 102(b) as being anticipated by Kitagawa, Naotaka (PCT/US98/12797).** Applicants respectfully request the Examiner's reconsideration in view of above amendments and following remarks.

Statement of Facts

Kitagawa discloses a porous crosslinked hydrophilic polymeric material having cavities joined by interconnecting pores wherein at least some of the cavities at the interior of the material communicate with the surface of the material. The present invention also relates to a process for producing the polymeric material. This process involves combining a hydrophilic monomer phase with an oil discontinuous phase to form an emulsion, and polymerizing the emulsion. The emulsion can be a high internal phase emulsion (i.e., a "HIPE"). The polymeric material can be produced in a variety of forms. In one embodiment the emulsion is suspended in an oil suspension medium, and emulsion droplets are polymerized to produce polymeric microbeads. Abstract – Emphasis added

Kitagawa further teaches that the “microbeads are useful in a variety of applications, including absorption of bodily fluids, absorption or transport of solvents or other chemicals, and scavenging of, e.g., aqueous fluids. (Page 4, lines 33-35 emphasis added)

Kitagawa further discloses that “in one embodiment the hydrophilic microbeads reach half maximal absorption capacity within 1 minute after immersion. These microbeads are particularly useful in applications requiring rapid absorption rates”. (page 5, lines 3-5 – Emphasis added)

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In contrast applicants' invention is directed to the problem of increasing the rate of solution or dispersion of polymers in water immiscible non-aqueous media. Applicants' porous bodies are soluble or dispersible in non-aqueous media comprising a three dimensional open cell lattice containing 10 to 95% by weight of a polymeric material which is soluble in water immiscible non-aqueous media and 5 to 90% by weight of a surfactant. The porous bodies having an intrusion volume as measured by mercury porosimetry of at least about 3 ml/g; and dissolves or disperses in the non-aqueous media in less than 3 minutes.

Applicants teach that the rapidly dissolving or dispersing porous bodies are a consequence of the method used to prepare the porous bodies. In contrast to Kitagawa applicants form an emulsion of water in a water immiscible liquid which contains a preformed polymer which is soluble in the water immiscible liquid. This emulsion is then rapidly frozen using a fluid freezing medium which cools both phases of the emulsion to below the freezing point of the liquids in the emulsion. Finally, the frozen emulsion is freeze dried to remove the frozen water and a water immiscible liquid by sublimation. (page 6, line 8 – 28).

Thus, in applicants method of preparation an oil-soluble polymer is already formed before the preparation of the porous bodies and no polymerization takes place during the preparation of the porous body.

#### Applicants Argument

As discussed above and in the accompanying supporting document from Billmeyer (Exhibit 1) it is a well established fact in polymer science that cross-linked polymers are insoluble.



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The porous materials disclosed by Kitagawa are composed of a continuous network of a cross-linked hydrophilic polymer. As such these materials are incapable of dissolving or dispersing when contacted by a hydrophobic liquid (i.e., a water-immiscible liquid). Indeed, the whole objective of Kitagawa is the creation of crosslinked polymeric material that has a high capacity to absorb hydrophilic liquids and solvents, would be defeated by a porous polymeric material that rapidly dissolves or disperses in the hydrophobic liquid, and is comprised of hydrophobic polymers.

Thus, the hydrophilic cross-linked polymeric materials disclosed by Kitagawa are incapable of being soluble or dispersible in non-aqueous media, let alone dissolving or dispersing in the non-aqueous media in less than 3 minutes and are not a three dimensional open cell lattice comprised of a polymeric material which is soluble in water-immiscible non-aqueous media.

MPEP 706.02 states that

“...for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present.”

Absent the teaching of a porous body which is soluble or dispersible in non-aqueous media, which can dissolve or disperse in the non-aqueous media in less than 3 minutes and which comprises a three dimensional open cell lattice comprised of a polymeric material which is soluble in water immiscible non-aqueous media, Kitagawa can not anticipate applicants claims.

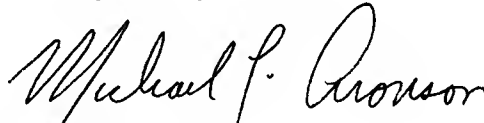
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Neither is applicants' invention obvious from the teachings of Kitagawa. Kitagawa is directed to an entirely different objective technical problem from applicants' invention: Increasing retention and absorbency of hydrophilic liquids and solvents by polymeric bodies Vs increasing the rate a solution or dispersion of polymers in water immiscible liquids. Applicants submit that by teaching materials which are formed in-situ by polymerization and crosslinking of hydrophilic monomers, Kitagawa, in point of fact, teaches away from applicants' porous bodies and method of preparation.

In view of the foregoing amendment and remarks, applicants respectfully request that the application be allowed to issue.

If a telephone conversation would be of assistance, Applicants' undersigned agent invites the Examiner to telephone at the number provided.

Respectfully submitted,

A handwritten signature in black ink, reading "Michael P. Aronson". The signature is fluid and cursive, with the first name "Michael" and last name "Aronson" clearly legible. A horizontal line is drawn beneath the signature.

Michael P. Aronson  
Registration No. 50,372  
Agent for Applicant(s)

MPA/sm  
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1AP7 Rec'd PCT/PTO 27 JUL 2006

Express Mail #EJ 622 649 669 US

FORM PTO-1390 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE (REV. 10-95)		ATTORNEY'S DOCKET NUMBER
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. § 371		T3110(C)
		U.S. APPLICATION NO. (If known, see 37 CFR § 1.5) <b>10/587722</b>
INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP2004/014755	23 DECEMBER 2004	28 JANUARY 2003
TITLE OF INVENTION		
POROUS BODIES AND METHOD OF PRODUCTION THEREOF		
APPLICANT(S) FOR DO/EO/US		
COOPER, ANDREW IAN ET AL.		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a submission under 35 U.S.C. 371.</li> <li>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a submission under 35 U.S.C. 371.</li> <li>3. <input type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.</li> <li>4. <input checked="" type="checkbox"/> The US has been elected (Article 31).</li> <li>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. §371(c)(2)) <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input checked="" type="checkbox"/> has been communicated by the International Bureau.</li> <li>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</li> </ol> </li> <li>6. <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> is attached hereto.</li> <li>b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</li> </ol> </li> <li>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3)) <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> are transmitted herewith (required only if not communicated by the International Bureau).</li> <li>b. <input type="checkbox"/> have been communicated by the International Bureau.</li> <li>c. <input type="checkbox"/> have not been made, however, the time limit for making such amendments has NOT expired.</li> <li>d. <input checked="" type="checkbox"/> have not been made and will not be made.</li> </ol> </li> <li>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. §371(c)(3)).</li> <li>9. <input checked="" type="checkbox"/> An oath or executed declaration of the inventor(s) (35 U.S.C. §371(c)(4)).</li> <li>10. <input type="checkbox"/> An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. §371(c)(5)).</li> </ol>		
Items 11. To 16. Below concern document(s) or information included:		
<ol style="list-style-type: none"> <li>11. <input type="checkbox"/> An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98.</li> <li>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. §§3.28 and 3.31 is included.</li> <li>13. <input checked="" type="checkbox"/> A preliminary amendment.</li> <li>14. <input type="checkbox"/> An Application Data Sheet under 37 CFR § 1.76.</li> <li>15. <input type="checkbox"/> A substitute specification.</li> <li>16. <input type="checkbox"/> A power of attorney and/or change of address letter.</li> <li>17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 37 CFR 1.821- 1.825.</li> <li>18. <input type="checkbox"/> A second copy of the published International Application under 35 U.S.C. 154(d)(4).</li> <li>19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</li> <li>20. <input type="checkbox"/> Other items or information:</li> </ol>		

IAP12 Rec'd PCT/PTO 27 JUL 2006

U.S. APPLICATION NO. (if known, see 37 CFR 1.51) <b>10/587722</b>	INTERNATIONAL APPLICATION NO. PCT/EP2004/014755	ATTORNEY'S DOCKET NUMBER T3110(C)
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21. <input checked="" type="checkbox"/> The following fees are submitted:					
<input checked="" type="checkbox"/> a) Basic National Fee.....\$300.00					
<input checked="" type="checkbox"/> b) Examination Fee.....\$200.00					
<input checked="" type="checkbox"/> c) Search Fee.....\$500.00				\$1,000.00	
<b>TOTAL OF ABOVE CALCULATIONS:</b>					
<input checked="" type="checkbox"/> Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing or computer program listing filed in an electronic medium). The fee is \$250 for each additional 50 sheets of paper or fraction thereof.					
TOTAL SHEETS	EXTRA SHEETS	Number of each additional 50 or fraction thereof (round Up to a whole number)	Rate		
- 100 =	/50 =		X \$250.00		
Surcharge of \$130.00 for furnishing the oath or declaration later than 30 months from the earliest claimed priority date (37 CFR § 1.492(e)).					
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	20 - 20 =		X \$ 50.00		
Independent Claims	2 - 3 =		X \$200.00		
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			X \$360.00		
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$1,000.00	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.					
<b>SUBTOTAL =</b>					
Processing fee of \$130.00 for furnishing the English translation later than 30 months from the earliest claimed priority date (37 C.F.R. § 1.492(f)).					
<b>TOTAL NATIONAL FEE =</b>					
Fee for recording the enclosed assignment (37 C.F.R. § 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. §§ 3.28, 3.31). \$40.00 per property.					
<b>TOTAL FEES ENCLOSED =</b>				\$1,000.00	
				Amount to be Charged:	

- a. ☐ A check in the amount of \_\_\_\_\_ to cover the above fees is enclosed.
- b. ☒ Please charge Deposit Account No. 12-1155 in the amount of \$1,000.00 to cover the above fees. Triplicate copies of this letter are enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 12-1155. Triplicate copies of this letter are enclosed.

Customer Number: 00201

NOTE: Where an appropriate time limit under 37 C.F.R. §§ 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. §§ 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Respectfully submitted,



Ellen Plotkin  
Attorney of Record  
Reg. #36,636

EP/mt  
(201) 694-2253

# EXHIBIT 1

# **TEXTBOOK OF POLYMER SCIENCE**

**Second Edition**

Wiley-Interscience, a Division of John Wiley and Sons, Inc.

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## 2

# Polymer Solutions

### *A. Criteria for Polymer Solubility*

**The solution process** Dissolving a polymer is a slow process that occurs in two stages. First, solvent molecules slowly diffuse into the polymer to produce a swollen gel. This may be all that happens—if, for example, the polymer-polymer intermolecular forces are high because of crosslinking, crystallinity, or strong hydrogen bonding. But if these forces can be overcome by the introduction of strong polymer-solvent interactions, the second stage of solution can take place. Here, the gel gradually disintegrates into a true solution. Only this stage can be materially speeded by agitation. Even so, the solution process can be quite slow (days or weeks) for materials of very high molecular weight.

The degree of swelling of a lightly crosslinked polymer can be measured and related to the thermodynamic properties of the system, but this phenomenon is not widely utilized at the present time.

**Polymer texture and solubility** Solubility relations in polymer systems are more complex than those among low-molecular-weight compounds, because of the size difference between polymer and solvent molecules, the viscosity of the system, and the effects of the texture and molecular weight of the polymer. In turn, the presence or absence of solubility as conditions (such as the nature of the solvent or the temperature) are varied can give much information about the polymer; this is in fact the topic of most of this chapter.

From what has already been said, it is clear that the topology of the polymer is highly important in determining its solubility. Crosslinked polymers do not dissolve but only swell if indeed they interact with the solvent at all. In part, at least, the degree of this interaction is determined by the



extent of crosslinking: lightly crosslinked rubbers swell extensively in solvents in which the unvulcanized material would dissolve, but hard rubbers, like many thermosetting resins, may not swell appreciably in contact with any solvent.

The absence of solubility does not imply crosslinking, however. Other features may give rise to sufficiently high intermolecular forces to prevent solubility. The presence of crystallinity is the common example. Many crystalline polymers, particularly nonpolar ones, do not dissolve except at temperatures near their crystalline melting points. (Because crystallinity decreases as the melting point is approached (Chapter 5) and the melting point is itself depressed by the presence of the solvent, solubility can often be achieved at temperatures significantly below the melting point.) Thus linear polyethylene, with crystalline melting point  $T_m = 135^\circ\text{C}$ , is soluble in many liquids at temperatures above  $100^\circ\text{C}$ , while even polytetrafluoroethylene,  $T_m = 325^\circ\text{C}$ , is soluble in some of the few liquids that exist above  $300^\circ\text{C}$ . More polar crystalline polymers, such as 66 nylon,  $T_m = 265^\circ\text{C}$ , can dissolve at room temperature in solvents that interact strongly with them (for example, to form hydrogen bonds).

There is little quantitative information about the influence of branching on solubility; in general, branched species appear to be more readily soluble than their linear counterparts of the same chemical type and molecular weight.

Of all these systems, the theory of solubility, based on the thermodynamics of polymer solutions, is highly developed only for linear polymers in the absence of crystallinity. This theory is described in Sections *C* and *D*. Here, the chemical nature of the polymer is by far the most important determinant of solubility, as is elucidated in the remainder of this section. The influence of molecular weight (within the polymer range) is far less, but it is of great importance to fractionation processes (Sections *D* and *E*) which yield information about the distribution of molecular weights in polymer samples.

**Solubility parameters** Solubility occurs when the free energy of mixing

$$\Delta G = \Delta H - T \Delta S$$

is negative. It was long thought that the entropy of mixing  $\Delta S$  was always positive, and therefore the sign of  $\Delta G$  was determined by the sign and magnitude of the heat of mixing  $\Delta H$ . For reasonably nonpolar molecules and in the absence of hydrogen bonding,  $\Delta H$  is positive and was assumed to be the same as that derived rigorously for the mixing of small molecules. For this case, the heat of mixing per unit volume is (Hildebrand 1950)

$$\Delta H = v_1 v_2 (\delta_1 - \delta_2)^2$$